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Cites Big Growth, Future Needs

Science Post-Reagan: A Talk with Ex-Adviser Keyworth

The Washington science establishment was cool to George A. Keyworth II when he was appointed five months after Ronald Reagan's inauguration to the neglected posts of Presidential Science Adviser and Director of the Office of Science and Technology Policy. A little-known physicist from Los Alamos, and a protege of emotion-rousing Edward Teller, Keyworth was far from first choice for the dual jobs. In those early budget-cutting days, he publicly took the line that science was bloated and would benefit from a dose of austerity. Inside the White House, however, Keyworth became an effective proponent of big budgets for academic basic research, and the money flowed to record levels. Keyworth resigned in 1985 to run his own consulting firm in Washington. Last month, he became Director of Research of the Hudson Institute, Indianapolis. Keyworth spoke with SGR Editor Greenberg on February 29. The following is from that conversation, transcribed and edited by SGR.

Q. Why are many of the leaders of science having another quadrennial panic about Presidential science advice? Is it not working well?

Keyworth. They feel that it's not working well. But look at federal support for science and technology. We've had six to eight generous years. It's all forgotten

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every single year in the period December through early March as you're going through the panic of the next budget. If you look at recognition of the role of science and technology in this country, it's been good. If you look at it overall, you've got to give it a B. It doesn't merit an A. But this is a good time to be a scientist or a technologist. Then what's the gripe? The gripe is that there are insufficient laurels being tossed to us.

Q. Like what?

Keyworth. The scientific community does not feel that it's being listened to with a sufficient degree of respect and attention. Quite candidly, our community has more than its share of spoiled children. I don't mean *prima donnas*. What I mean is simply vestiges of a time when we were given an enormous amount of support, asked for little accountability, and asked for little in return, and we have become very used to that. And we are spoiled in the sense that, as a community, we're a bit egotistical. We somehow believe that our words—no matter on what subjects, whether they are on something

that we know about, or whether they are on matters where we have less than average exposure—should be given a unique degree of credibility. But we haven't earned that.

Q. Critics of the present system of science advice for the White House complain about the care and feeding of science and the wise application of science and technology. Are they engaged in realism or fantasy?

Keyworth. I think they're in a fantasy world, but I'll qualify that. The first complaint, care and feeding, is a measure of my community and its insatiability. I certainly
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In Brief

Despite a tight lid on increased spending in Fiscal 1989, the House Budget Committee has gone a substantial way toward accommodating three big growth items in R&D. The National Science Foundation was allocated \$300 million of a requested \$333 million in growth. The Department of Energy got an extra \$100 million of \$400 million requested—with an unwritten understanding that it's for the Superconducting Super Collider (SSC). NASA got \$1.25 billion of a growth request of \$2.55 billion; most of that's for the space station. But there's still a long way to go on Capitol Hill's winding budget road.

The increases, totaling about half of the agreed-upon growth in domestic discretionary spending, benefited from strong lobbying. When prospects looked dim for the SSC, Budget Committee Chairman William H. Gray III, of Philadelphia, heard from the Teamsters, who stressed that the SSC's 53-mile concrete tunnel was "a big pour."

Arizona, one of the seven states remaining in the SSC site competition, has beefed up its lobbying operation by hiring the law firm of former Senator Paul Laxalt (R-Nevada) to "represent us in what is clearly intense competition," according to the state's SSC Project Coordinator. Laxalt, a longtime Reagan crony, will team up with the Washington public relations firm Hartz/Meek International, which, since last June, has been pushing Arizona's SSC cause, at a rate of \$290,000 per six months service (SGR Nov. 1, 1987).

With the national political mood swinging toward unmet domestic needs, the Pentagon budget is inspiring comparative polemics. One of the latest, from the American Federation for Clinical Research: "In 18 months, the Department of Defense spends more on research and development than the National Institutes of Health has spent in its entire 100-year existence."

... No Matter What the Budget, Scientists Will Complain

(Continued from page 1)

ly experienced it myself. It made no difference whether the National Science Foundation got an 18- or a 28-percent increase. The same response was always there: It's a drop in the bucket compared to what is needed. Even if were true, it shows what little respect there is for the system or the public that has to provide that money.

The second point, wise advice, is a real need. The question of whether we're up to it or not leaves me with something less than great pride. Take an example. We sit here with the space program in nothing less than total limbo. We can attribute it to the *Challenger* tragedy, but the problem goes far back. I've spoken in past times about why I could not be enthusiastic about the space station. And I say now as I said then, it's a lead balloon. It's too little, too late, and doesn't provide an adequate focus or sense of direction for a public that wants to see a leap in technology and capability. We, the scientific community, have not played a very cohesive or clarifying role in trying to look at the real options that are before this country in space.

Third in a special SGR series on Science Policy for the Next Presidency. Previous interviews were with Frank Press, President of the National Academy of Sciences (January 15, 1988,) and Orville C. Bentley, Assistant Secretary of Agriculture for Science and Education (February 15).

Q. Many people in the scientific community have been saying what you've just said about the space station.

Keyworth. True. But some of those arguments came from the usual zero-sum game—that I don't want it to go to them because it might come away from me. It's the story that we're hearing on one side of the SSC [Superconducting Super Collider] argument. I think there's a legitimate debate on the SSC, but most of what you're hearing is one group of scientists who believe that that huge pot of measurable money should be distributed to them.

Analyses of where we are in the space program are legion. The question of what to do is where I think an inadequate amount of attention and effort has been paid by the scientific community.

Q. What would you do?

Keyworth. I would try to chart out the best, the most efficient, and most rapid possible program to get a single-stage-to-orbit craft built. The Air Force's manifestation of that is the National Aerospace Plane. I think the space program has been retarded primarily by a very high cost of getting something into orbit. The Aerospace Plane is a tough job, but that's the way for the United States to give its citizens something they want—something grand, something that does target unques-

tioned leadership. And there's a big spinoff: That technology is the surest way to maintain our preeminence in aeronautics and aircraft technology.

I'm delighted that the Air Force has been vigorous in embracing it. I wished that NASA had been more vigorous earlier on in joining with them in carrying out that endeavor. Now I see a very exciting prospect that's to be developed by the Air Force to meet their requirements. I worry about the space program and the commercial opportunities and I wonder whether there is anyone picking up those two considerations. The space program doesn't have a clear sense of mission.

Q. Is this an area where Presidential science advice should be applied?

Keyworth. I think so. We have a very pro-space President, and it's an area where helping to distinguish between the options—some of which make no sense at all; others which were just bureaucratic resistance to change—requires some real scientific insight. I offer space as an example, because I think it's as clear an example as I know of where the technical perspective is not always adequate.

Q. Obviously, a great failure has occurred. What is its origin?

Keyworth. The real origins of where we are right now in the space program go back to the fact that we didn't have a post-Apollo mission. Secondly, they go back to the fact that we made a tragic decision to put all of our eggs in the Shuttle, back in the early '70s. Elements of the scientific community saw the dangers and risks that we were getting into and they've seen that all along. But what we haven't done is to try to figure out how to put together a coherent national program. Instead, what we've done is we've fought like hell for segments that different people were interested in. We haven't paid attention to the whole.

The mismatch between what people would like to see in science advice versus the way it's done reflects the fact that the scientific community has not demonstrated,

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... Aides Didn't Share Reagan's Enthusiasm for R&D

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or extolled or even respected, the sense of public service that was rampant in the scientific community in the early post-war years.

Q. *World War II produced a number of scientific celebrities that Congress and the public took seriously.*

Keyworth. Those celebrities took that trust seriously.

Q. *Today, we don't have any scientists or engineers whose word is taken as gold.*

Keyworth. I'm not certain precisely why this has occurred, other than a natural manifestation of a society that has gotten very, very wealthy and has lost consciousness of how that wealth was earned. Nevertheless, the scientific community as a whole probably places less pressure on its individual members to engage in public service and disregard narrow interests.

Q. *No President would let the directorship of the Office of Management and Budget or the National Security Council remain vacant for more than an afternoon. But when you left at the end of 1985, it was about 10 months before a successor was appointed.*

Keyworth. I don't think the leaders in this country yet are really aware of the magnitude of R&D that the federal government pursues. You can say the words "half of the total" [of all US R&D]. You can point out what a large fraction of so-called discretionary funds are dedicated to R&D. Nevertheless, it has somehow not risen to the list of major public priorities. Until R&D and science and technology are seen as major levers in what the nation as a whole wants, that won't happen. But I think it is changing very quickly. You can look at AIDS, to the space program, to the need for better defense without simply throwing more money at it, etc. There are more and more reasons why science and technology are higher and higher in the public eye.

My perception when I was in the White House was that the President was the one who was always conscious of what science and technology meant to the public. The reason why the President was so positive about space, for example, was because space to him is one of those things that is purely optimistic. And that's why he was always so supportive of investments in science and technology.

But if you ask me how that perception was spread across the White House, I can't even keep a straight face. And I don't think the perception is terribly wide in Congress.

Q. *Then this current agitation to elevate the visibility and role of science advice probably has a good purpose to it.*

Keyworth. No question. Is agitation to increase the priority of science and technology in government constructive? Absolutely. And I don't say that because I as

"Willy Sutton" Theory of R&D

From a statement to the Senate Budget Committee hearing on science and technology, March 16, by Lewis M. Branscomb, Director, Science, Technology and Public Policy Program, Kennedy School of Government, Harvard, and former Chief Scientist, IBM.

... when the federal government decides to help commercial industry, for example in semiconductor manufacturing or in superconductivity, it uses the "Willy Sutton theory" of technology policy. Even though the assignment seems to belong to the Department of Commerce, you give the mission to the military, because that is where the money is.

A more viable long-term strategy is a lean and efficient Defense Department that sticks to its mission, working with non-military agencies missioned, staffed and funded to work with the private sector to build the national technology base needed for both defense and the civil sector . . .

State governments have grown in sophistication and capability a great deal in the last 25 years. They are investing some \$2 billion a year in high-technology activities designed to build their economies. Yet with few exceptions, the federal agencies ignore state plans and strategies, and the two efforts are very poorly coordinated . . .

A better approach to evaluating the "megaprojects" is badly needed, and a better approach to carrying out those that pass muster. For reasons I have never completely understood, the rigor with which the technical benefits from new projects are assessed varies inversely with the size of the project. A \$50,000 grant request from NSF is scrutinized by a number of the top experts in the country. Only a minority of the best projects are funded.

But a major program like the National Aerospace Plane seems to be launched without any credible basis for believing that it makes sense at all. Few red-blooded engineers want to attack any technically aggressive program that budgetmakers are prepared to defend.

a scientist think it deserves a higher priority. My experience has been that if you go out there to North Dakota or someplace and give a talk to people in the Chamber of Commerce or whatever, you find that people want their children to grow up to be computer programmers, or engineers, or scientists. They see technology as an opportunity. That to me is a manifestation of a rising

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... Delay in Appointment Made it Harder for Graham

(Continued from page 3)

public priority. But there is usually a mismatch between what the public senses and what Washington responds to. In this case, the scientific community clamoring for higher priority is constructive. Whether we are prepared as a community to carry out those public expectations or whether the scientific community has the slightest comprehension of how best to do that is another issue.

Q. *Some say it would be useful to elevate the Science Adviser in the White House staff hierarchy.*

Keyworth. If there's one place in town where rank doesn't make any difference, except for one man, it's in the White House. Changing the title on the door isn't going to make the slightest bit of difference. The importance of the place in the hierarchy is an external perception. Also, there's a lot of talk about PSAC [the defunct President's Science Advisory Committee, which possessed a large measure of independence] versus a committee which is lower profile but more intimately connected to the policy-making apparatus in the White House. The issue is hardly worth debating. PSAC had stopped functioning effectively long before it was abolished.

Q. *It's claimed that PSAC brought in a kind of independence and long-term view that's useful for a White House that's dominated by urgent day-to-day problems.*

Keyworth. The idea that it brings independence is the very reason that it lacks credibility, because independence, in that case, raises the question of accountability. Go back to why Richard Nixon abandoned the PSAC and threw his Science Adviser out of office. It was because they had independence and lack of accountability.

But you do need advice from people who aren't immersed in the noise of Washington. That's why an advisory council is important. I didn't exactly get encouragement in my desire to set up a White House Science Council when I was there. Frank Press [Science Adviser to President Carter] was quite candid with me about the difficulties he had had in trying to develop one. I was well aware of the negatives after I had been there six months. I realized that I was essentially being isolated from the kind of people I thought I needed and knew how to interpret. So, you do need advice. But the idea of independence and lack of accountability isn't terribly realistic.

Q. *How's your successor [William R. Graham] doing?*

Keyworth. Bill? I think he's doing well. Bill and I have different styles. But I think Bill has done a good job, and if you look at it from the inside, I think Bill is well respected. I think people should realize that it's probably a lot more difficult to be a Science Adviser who comes into a team that has its *modus operandi* already established versus somebody who comes in during the period when everyone else is engaged in the learning process also.

Q. *If you could write a charter of Presidential science advice for next time, would you say it's worth the effort or do you have to wait for the President to indicate his preference?*

Keyworth. I think it's worth developing some concepts. But every effort should be made to first understand the requirements of the presidency, rather than to go ahead from the point of view of what the scientific community would like. I think a good portion of the debate about PSAC has to do with the latter rather than the former. It's valuable that scientists talk to candidates, to people in the Congress. There hasn't been a time in my memory when so many of the candidates were beginning to be aware that technology is a public priority. It is becoming a political issue. As that happens, those candidates are going to have more and more need to know how to capture that priority.

Q. *In 1984, John Glenn pitched his presidential primary campaign on the theme that he'd be the science and technology President, because that's our future, he said. And he aroused no interest.*

Keyworth. The government's role in science and technology is of little interest to the public. To the public, people get paid to run the government. And the very nature of our representative democracy doesn't require that the public get into the intricate details of exactly how it's done. However, perhaps one of the better leadership and motivating speeches given by a President in the postwar years was Kennedy's speech that launched the Apollo project. That wasn't talking about science and technology. It was talking about a goal that was executed by science and technology. I was astonished when Richard Nixon was asked on television a couple of years ago about the most important thing he'd ever done. He did not say it was his overture to develop relations with the People's Republic of China. He said the War on Cancer.

Q. *At the recent House hearing on OSTP [SGR March 1], several witnesses said that the size and quality of the OSTP staff have declined.*

Keyworth. When we wanted to get excellent people, we didn't have the slightest difficulty. But it's harder to get people to come into the later years of an Administration. The first year is when most of the policy directions are established. We did have arguments all the time, not about how to do something but about what to do. That was a very exciting time. Now what you're trying to do is implement as much as you can, and it's probably a less exciting process. You're also asking people to uproot themselves for a relatively short period. I had hoped that by leaving when I did, there would be enough time to leave another chapter or two open. Not filling that job for 10 months made it a lot harder for Bill.

Vague Pact Puts Europe on Board US Space Station

London. Students of wishful thinking will find much to admire in the space station agreement between the US and Western Europe, at last concluded, after three years of labored negotiations. Great uncertainties remain, but the essential fact is that with relatively little public notice, this multi-national venture is on its way as possibly the costliest single high-tech enterprise of the century.

The 11-page agreement sets out rules for operating a US-led \$20-billion international space base, scheduled to be built by the late 1990s, with help from the 13-nation European Space Agency (ESA), plus Canada and Japan. (Britain, an ESA member, says it has better uses for its scarce R&D money and has declined to take part.)

Several important aspects of the ESA-NASA agreement are left deliberately vague in the document, partly because of the partners' inability to find common ground and partly because of unavoidable unknowns in a decade-long complex undertaking. But, after a great deal of debate and soul searching about Europe's technological future, the agreement was accepted by ESA on March 17 at a meeting in Paris. A signing ceremony with NASA will take place in a month or two, while separate negotiations with Canada and Japan are said to be moving along satisfactorily.

With the agreement in hand, ESA will be able to get on with plans for its Columbus orbiting laboratory, a \$4-billion craft that will be integrated with the US-built core of the space station. Japan will build a similar laboratory, and the US will provide a third lab, plus a living unit for a base crew of up to eight. Canada is expected to supply robotic maintenance equipment.

Though not secret, the agreement is not being broadcast about. A copy obtained by this correspondent shows that, in response to European insistence, the US backed down from its initial concept of foreigners as mere guests on a US-run facility, and agreed that the partners would have major say in operations of the station. The details of management were left vague, but European participants in the talks say the outcome represents a major and long-resisted concession by the US.

In other areas, however, the Americans yielded little or nothing to European demands, including clarification of what is permissible onboard in defense-related studies. Military research is barely mentioned in the document, which covers in some detail a range of subjects, among them legal rights of the crew, intellectual property rights derived from activities in space, and procedures to classify radio communications to and from the station.

The military issue, of particular concern to neutral Sweden, as well as other members of ESA, was attended to in the agreement with a declaration that the base

will "remain a civil station, and its operation and utilization will be for peaceful purposes, in accordance with international law." This can be interpreted to exclude weapons testing and activities in violation of the Anti-Ballistic Missile Treaty. Thus, it appears that the US Defense Department is free to conduct other research in the parts of the station provided by the US.

This seems to follow from ESA's insistence, written into the text, that the European nations will control day-to-day operations of their own laboratory, Columbus. "At least we will be masters in our own house," said a West German diplomat closely concerned with the negotiations.

Details of the management structure are not dealt with in the agreement, which simply states that the US will be "responsible for overall program coordination and direction of the space station," while the other countries are to "retain jurisdiction and control" over the elements they provide. The management of the base will be assigned to an on board commander, very likely an American, but the other countries are not excluded from the role. A network of ground-based committees is also in the picture, and it's assumed that these will usually be based at the Johnson Space Center, in Houston, NASA's control center for manned space flight.

The agreement provides no guidelines for running the committees, other than stating that "decision making by consensus shall be the goal." The wording was insisted upon by the Europeans as a minimal guarantee of their rights, but they recognize that the US, if it insists, will have the last word, even though the text does not say so. The agreement is silent on what happens if the goal of consensus is not achieved.

The agreement is also diplomatically unclear about payment of operating costs, an important matter, since it's estimated that they will run to at least \$1.5 billion a year. It simply states that each partner will share "on an equitable basis the agreed common costs of the operation of the space station."

Another noteworthy aspect of the accord is that it will be in the form of an intergovernmental agreement, rather than a treaty, which usually carries greater political and diplomatic weight. Initially, the partners favored treaty status, but the labyrinth of ratification was considered too daunting. As the agreement is written, it appears to leave generous room for states to opt out, if they so please.

The escape clause in the text states: "Any partner . . . may withdraw from this agreement at any time by giving . . . at least one year's prior written notice." But the document is studiously woolly about the options for a country that runs into funding problems: "Financial obligations of each partner pursuant to this agreement are

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In Print: Federal Labs, Tech Transfer, Superfund, Etc.

Publications are obtainable as indicated—not from SGR.

Three reports from the General Accounting Office, which conducts investigations for the Congress:

Competition: Issues on Establishing and Using Federally Funded Research and Development Centers (GAO/NSIAD-88-22, 54 pp.), report for the House and Senate Armed Services Committees in response to claims that the FFRDCs—privately operated, publicly financed R&D organizations—have an inside track on project awards that industry could do better and cheaper. GAO concludes with a cautious maybe, and recommends that the Pentagon experiment with “broad agency announcements” (bids for proposals) to compare industry with the cocooned FFRDCs, of which GAO studied 12, including Lincoln Lab, Lawrence Livermore, Aerospace Corp., and MITRE C3I.

Most interesting are the extensive budget and staffing data GAO compiled on these hybrid facilities: Numbering 36 in all, 20 are sponsored by the Department of Energy and 5 by DoD, for total annual expenditures (in 1986) of \$4.7 billion, 9 percent of all federal R&D that year.

Technology Transfer: Constraints Perceived by Federal Laboratory and Agency Officials (GAO/RCED-88-116BR), 23pp., conducted for the Task Force on Technology Policy of the House Science, Space, and Technology Committee, this GAO inquiry examines what’s gumming up industrial collaboration and technology transfer at federal labs. Answers: Industry is reluctant to market federally developed computer software because, unlike other products of the labs, software is not

Space Station (continued from page 5)

subject to its funding procedures and the availability of appropriated funds. Recognizing the importance of space station cooperation, the partners undertake to make their best efforts to obtain approval for funds to meet these obligations, consistent with their respective funding procedures. In the event that funding problems arise that may affect a partner’s ability to fulfill its responsibilities in space station cooperation, that partner . . . shall notify and consult with the other cooperating agencies.”

That’s something short of an ironclad contract, but, given the huge costs and technological uncertainties inherent in big space operations, it’s probably the best that could be expected from an effort to underwrite this vast multi-national enterprise.—Peter Marsh

(The author is technology correspondent of the London *Financial Times*.)

subject to copyright; requirements of equal access to federal labs clashes with industry’s proprietary interests.

Superfund: Extent of Nation’s Potential Hazardous Waste Problem Still Unknown (GAO/RCED-88-44, 40 pp.), requested by several members of Congress, this GAO study estimates that the number of “potential hazardous waste sites” ranges from 130,000 to 425,000, and that the real nasty ones, which are eligible for clean-up under the Superfund, are far more numerous than previously estimated.

GAO reports are available without charge from: GAO, PO Box 6015, Gaithersburg, Md. 20877; tel. 202/275-6241.

The Defense Technology Base: Introduction and Overview (GPO Stock No. 052-003-01099-2, 113 pp.), first in a series of studies of defense technology by the Congressional Office of Technology Assessment, this report warns of sagging capabilities in defense industry as a result of budget fluctuations, use of foreign suppliers, and DoD’s relatively limited market strength in advanced technologies with civilian and military applications.

\$5.00, USGPO, Superintendent of Documents, Washington, DC 20402; tel. 202/783-3238.

Two reports from NSF:

Women and Minorities in Science and Engineering (NSF 88-301, 227 pp.), fourth in a biennial series mandated by the Science and Technology Equal Opportunities Act of 1980, this is the basic book of data and analysis on the title subject. It shows a growing presence of women in the professions, from 9 percent in 1976 to 15 percent in 1986. Employment of blacks rose from 1.6 to 2.5 percent during that same period. Unemployment among black scientists and engineers stood at 3.8 percent in 1986; for whites, it was 1.5 percent.

Project Summaries: Division of Science Resources Studies: Fiscal Year 1987 (NSF 87-315, 91 pp.), seventh in an annual series from the NSF division that is the principal source of statistical data and analysis concerning science and technology, related educational activities, R&D employment, and international comparisons in these areas. Covering work in progress or completed between October 1, 1986, and September 30, 1987, this volume describes scores of routine and special studies conducted by the division, lists publications, and tells how to order them.

No charge. NSF, Division of Science Resources Studies, 1800 G St. NW, Washington, DC 20550; tel. 202/634-4634.

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NSF Pulls the Plug on Two of Six Engineering Centers

Just in time to counter fears that its research centers will become an eternal mortgage on a strained budget, the National Science Foundation has revealed that it's turning off the money on two of six centers established in 1985. The revelation was between the lines of an announcement of good news for the four centers that passed mid-term review of conditional five-year awards.

The dropouts, not mentioned by name in an NSF press release, are the Center for Robotics Systems in Microelectronics, at UC Santa Barbara, and the Center for Composite Materials, at the University of Delaware. Both were in the initial batch of six that inaugurated NSF's Engineering Research Centers program, a pet project of NSF Director Erich Bloch. It has also become his political nightmare, as concerned-sounding Congressmen, few of whom know little science from Little Bo Peep, regularly lecture the NSF brass on the virtues of small-scale science.

Designed to be multi-disciplinary and linked to industry, the centers have inspired both hot pursuit and anxiety fits in academic science and engineering. Offering \$2-3 million a year from NSF, and the possibility of up to 11 years support upon passage of periodic reviews, the ERC program has drawn hundreds of expensively prepared applications, and much nervous conjecture about NSF abandoning little science. So far, only 14 ERCs have been established, and they take up only about \$30 million of NSF's \$1.7 billion this year, but the trends are said to be frightening.

Contending that multi-disciplinary, well-equipped centers represent a necessary progression in the conduct of research, Bloch planned to extend the centers con-

cept beyond engineering this year through a new, NSF-wide program of Science and Technology Centers. But after NSF's budget growth was unexpectedly held down in the tumultuous closing days of the last Congress, he postponed the new centers program for a year. When the fiscal 1989 budget was announced, it contained something new—\$150 million clearly earmarked for five years worth of financing of new centers. The intent was to segregate the money and thus counter fears that centers money was coming out of the budgets of little science. The Congressional appropriations committees are now pondering the \$150 million request.

The Delaware and Santa Barbara ERCs will be financed by NSF through the end of fiscal 1989, and then they're on their own. The four that passed review are:

Center for Telecommunications Research, Columbia University.

Biotechnology Process Engineering Center, MIT.

Center for Intelligent Manufacturing, Purdue.

Systems Research Center, University of Maryland, in collaboration with Harvard.

Mathematicians Cool on the Pentagon

The Strategic Defense Initiative and military support of mathematics research came out losers in a referendum tallied last month by the American Mathematical Society.

With about 7000 of 20,000 members voting, 57 percent approved a motion urging AMS to "lend no support to the Star Wars program." Nearly three quarters of the voters approved a motion calling for AMS to support an increase in non-military funds for math.

On other issues: 89 percent approved a motion warning against the "trend toward large [research] teams and big projects," and urging "every effort to increase the number of individual investigators . . ." Ninety percent voted to urge funding agencies to recognize the importance of basic research.

In Print (Continued from page 6)

Health Promotion and Disease Prevention, United States, 1985 (GPO Stock No. 017-022-01030-5, 91 pp.), latest published data derived from the federal government's extensive surveys of public attitudes and practices concerning health, including diet, use of medical services, smoking, alcohol, injury prevention, etc.

\$4.50, USGPO, Superintendent of Documents, Washington, DC 20402; tel. 202/783-3238.

Shifting Responsibilities: Federalism in Economic Development, (149 pp.) by DeWitt John, Senior Economist, National Governors' Association, includes a review of federal efforts to employ R&D as an economic stimulus and the current boom in state and local efforts to assist the development of high-tech industry.

\$12.50, NGA, Publications Office, 444 N. Capitol St., Suite 250, Washington, DC 20001-1572; tel. 202/624-7880.

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In Quotes: Social Sciences Don't Belong in the Academy

Some influential physicists and other "hard" scientists in Washington science-policy circles will privately reflect the view that the social and behavioral sciences are an intellectual mush that can contribute little of use in policy deliberations. A rare instance of public utterance along these lines is provided in a recently published interview with the late Nobel laureate and former presidential science confidante I. I. Rabi, along with his tart comments about engineers. Rabi's remarks appear in Science and Technology Advice to the President, Congress and Judiciary (Pergamon Press, 1988), edited by William T. Golden, President of the New York Academy of Sciences. Following are excerpts.

Rabi. What has happened with the [National Academy of Sciences] (NAS) is that we've added new divisions in recent years, like sociology and economics, that really have no place there . . . Sociology and economics are valuable in themselves, but they're not science in the sense of physical and biological sciences. When the Academy speaks on such subjects, however, it speaks to politicians who feel they are just as capable of talking about such subjects as are the scientists, maybe more capable.

Golden. You mean when they talk about economics or the other social sciences as distinguished from the physical and biological sciences?

Rabi. Yes. And I think it's disastrous. We did that with the President's Science Advisory Committee (PSAC)—I recall [Daniel] Moynihan [now Senator from New York, one of the first social scientists appointed to PSAC] and some others. And, of course, these social scientists are very knowledgeable; they know all the gossip and so on—very impressive that way. And pretty soon the hard scientists are cowed and don't speak with their own voices . . .

Golden. [Asks about changes at the NAS].

Rabi. Fred Seitz [NAS President, 1962-69] changed the scene. He brought in the engineers, put them on an equal footing with the scientists, and that, I think, was devastating because, whatever you can say about the engineers (and they're wonderful and essential people), they're not scientists. They don't

have that kind of thinking. And they have a lot of money. They feel, therefore, that they're very powerful and right . . .

Golden. So you would not have created a National Academy of Engineering (NAE); or, if it had been created, you would not have placed it in this close affiliation with the National Academy of Sciences [of which the NAE is a part]?

Rabi. That's right. They could be by themselves. Any connection of engineering with science can only degrade science. Science is other-worldly; engineers are practical people. And the people who get elected are not necessarily great engineers; many of them are heads of corporations and very valuable to our culture, but not to our science . . .

[Some members of the Academy have felt very strongly that the Academy made damn fools of themselves in recently rejecting for membership a noted sociologist [sic—Rabi is apparently referring to Samuel P. Huntington, Director of the Center for International Studies, Harvard, a political scientist whose election was successfully opposed last year by Serge Lang, a Yale mathematician who accused Huntington of misusing mathematics in writings supporting US military activities in Vietnam.] And it made a big splash in the newspapers . . .

Golden. Differences of views are not a fault of the Academy . . .

Rabi. No, no, it's not the fault of the Academy. I wasn't at the meeting, but this particular instance, in the way it occurred, was unfortunate. It demonstrated that the sociologists shouldn't have been in the Academy at all.

Golden. You mean any sociologists?

Rabi. Yes, any sociologists.

Golden. And the point you're making is that the Academy should confine itself to the physical and biological sciences and mathematics?

Rabi. That's right. Sociologists have no unique thing to bring to the Academy. The fact that you can have controversy within a discipline, controversy over issues that very often can't be decided, is significant. It's not true of the hard sciences, at least very rarely . . .

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